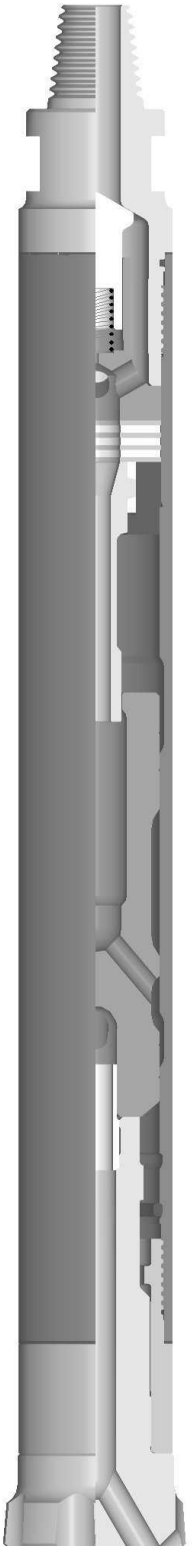

HYPER SERIES

MAINTENANCE, OPERATING AND SERVICE MANUAL

HYPER 31,41,51,63 & 81 MODELS

Bulroc [U.K.] LTD

ISOQAR REGISTERED

UKAS MANAGEMENT SYSTEMS 0026

Certificate No. 2448/00

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Due to our policy of continued product development, product specification may be subject to change. E & O.E

Congratulations

On purchasing a Bulroc DTH Hyper Hammer

Now ...

Go drill it.

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1. INTRODUCTION

The BULROC range of Hyper down the hole hammers are strong and robust tools of a simple and straight forward design to provide maximum performance, with a minimum of maintenance.

Please Note:
That, contrary to other BULROC hammer models, the Hyper series ***do use*** bits with Footvalves.

BULROC Hyper hammers are supplied as standard with a Check Valve arrangement which is designed to maintain the pressure inside the hammer when the air is switched off and so help prevent contaminated water from entering the hammer.

BULROC Hyper hammers are designed to give optimum performance with the minimum consumption of compressed air. If, however, particular deep-hole application require extra air flushing. This can be achieved by drilling through the soft alloy plug in the piston.

ALWAYS THINK

SAFETY FIRST!

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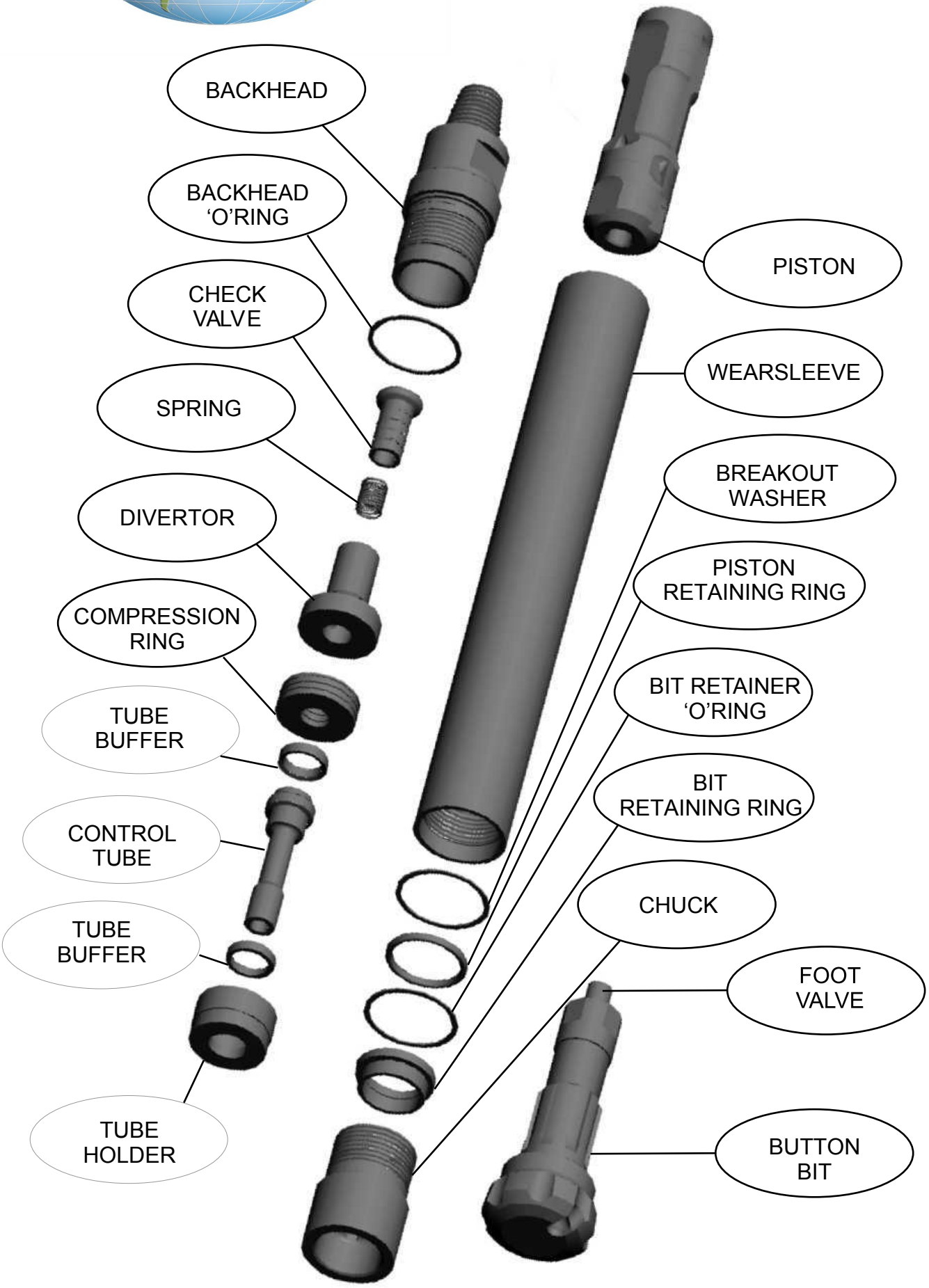
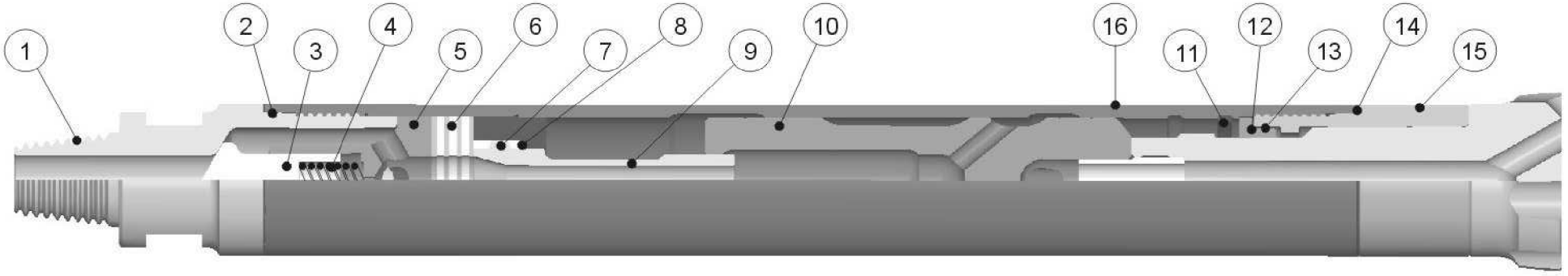
HYPER HAMMERS



3. HYPER HAMMER PARTS LIST

REF	PART NUMBERS					
	DESCRIPTION	HYPER 31	HYPER 41	HYPER 51	HYPER 63	HYPER 81
1	BACKHEAD	HSH3138	HSH4138	HSH5138	HSH633803M	HSH8138
2	BACKHEAD 'O' RING	IPBOR01	IPBOR02	HSH5114	HSH6114	HSH8114
3	CHECK VALVE	IPRCV01	IPRCV02	IPRCV03	IPRCV04	IPRCV05
4	CHECK VALVE SPRING	IPRCVS01	IPRCVS02	IPRCVS03	IPRCVS04	IPRCVS05
5	DIVERTER	HSH3120	HSH4120	HSH5120	HSHS6120	HSH8120
6	COMPRESSION RING	HSH3128	HSH4128	HSH5128	HSH6128	HSH8128
7	TUBE HOLDER	HSH3131	HSH4131	HSH5131	HSH6131	HSH8131
8	TUBE BUFFERS	HSH3129	HSH4129	HSH5129	HSH6129	HSH8129
9	CONTROL TUBE	HSH3130	HSH4130	HSH5130	HSH6330	HSH8130
10	PISTON	HSH3103	HSH4103	HSH5103	HSH6103	HSH8103
11	PISTON RETAINING RING	HSH3132	HSH4132	HSH5132	HSH6132	HSH8132
12	BIT RETAINING RING	HSH3137	HSH4137	HSH5137	HSH6337093	HSH8137
13	BIT RETAINING 'O' RING	IPBOR01	HSH4137A	HSH5137A	HSH6137A093	HSH8137A
14	CHUCK RELEASE WASHER	HSH3126	HSH4126	HSH5126	HSH6326	HSH8126
15	CHUCK	HSH3135	HSH4135	HSH5135	HSH6335093	HSH8135
16	WEARSLEEVE	HSH3100	HSH4100	HSH5100	HSH6300	HSH8100

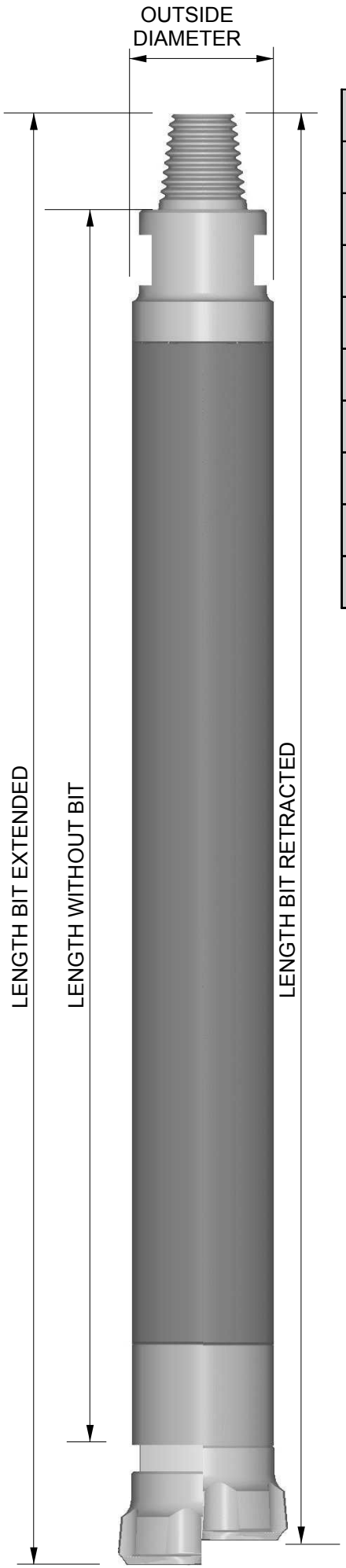


HEAVY DUTY WEARSLEEVES BACKHEADS AND CHUCKS ARE AVAILABLE ON ALL HYPER HAMMERS.
THESE ARE RECOMMENDED FOR USE IN PARTICULARLY ABRASIVE DRILLING CONDITIONS. THE INTERNAL COMPONENTS ARE IDENTICAL BUT THE 0/D'S OF THE WEARSLEEVE BACKHEAD AND CHUCK HAVE BEEN INCREASED.

NB. HEAVY DUTY HYPER 41 MODELS DO NOT USE CHUCK RELEASE WASHERS

(N.B. THE USE OF HEAVY DUTY PARTS LIMITS THE MINIMUM DIAMETER OF HOLE THAT CAN BE DRILLED BY THE HAMMER).

4. HYPER HAMMER SPECIFICATIONS



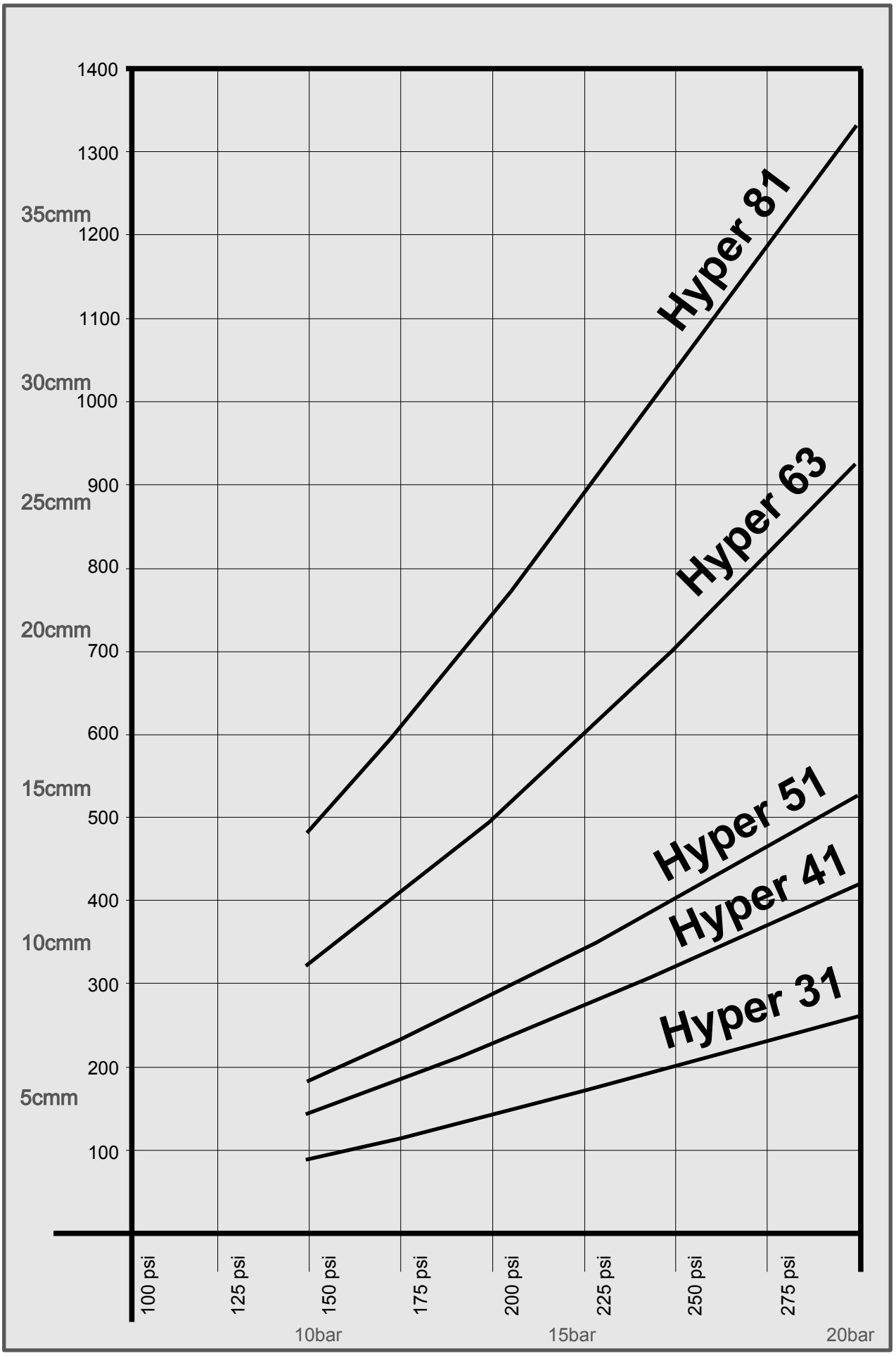
	HYPER 31	HYPER 41	HYPER 51	HYPER 63	HYPER 81
STANDARD BACKHEAD CONNECTIONS	2 3/8" API REG PIN	2 3/8" API REG PIN	3 1/2" API REG PIN	3 1/2" API REG PIN	4 1/2"API REG PIN
STANDARDCHUCK CONNECTION	MACH 33	DHD340A	DHD350R	DHD360	DHD380
LENGTH (WITHOUT BIT)	34.56" 878mm	38.97" 990mm	43.94" 1116mm	48.50" 1232mm	55.47" 1409mm
LENGTH (BIT EXTENDED)	38.77" 985mm	43.67" 1109mm	46.00" 1168mm	55.29" 1404mm	63.24" 1606mm
LENGTH (BIT RETRACTED)	37.55" 954mm	42.27" 1074mm	47.75" 1213mm	53.54" 1360mm	61.07" 1551mm
OUTSIDE DIAMETER OF HAMMER	3.12 79.2mm	3.75" 95.2mm	4.50" 114.3mm	5.55" 141 mm	7.25" 184.1mm
BORE DIAMETER	2.45" 2.2mm	3.00" 76.2mm	3.62" 92.0mm	4.58" 116.3mm	5.88" 149.4mm
PISTON STROKE	4.00" 102mm	4.25" 108mm	4.25' 108mm	4.25" 108mm	4.00" 102mm
PISTON WEIGHT	11.0 lb 5.0 kg	17.9 lb 8.15kg	26.8 lb 12.2 kg	49.0 lb 22.3 kg	113.3 lb 51.4 kg
COMPLETE HAMMER WEIGHT WITHOUT BIT	52.8 lb 24.0 kg	81.4 lb 37.0 kg	133 lb 60 kg	211.1 lb 96.0 kg	426.8 lb 194.0 kg

HYPER HAMMER CONVERSIONS

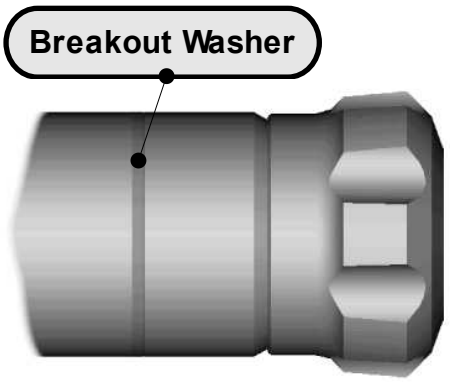
Parts Required

CONVERSION TO	CHUCK	BIT RETAINER	PISTON	COMPLETE HAMMER
HYPER 31				
MISSION A3015	HSH3135041	HSH3137041	HSH3103041	BR31H041
IR DHD 3.5	HSH3135040	HSH3137040	HSH3103040	BR31H040
HYPER 41				
MACH 44	HSH4135032	HSH4137032	HSH4103032	BR41H16
MISSION SD4	HSH41135042	HSH4137042	HSH4103042	BR41H07
HYPER 51				
MACH 50	HSH5135033	HSH5137033	HSH5103033	BR51H23
QL50	HSH5135098	HSH5137098	HSH5103098	BR51H25
MISSION SD5	HSH5135043	HSH5137043	HSH4103043	BR51H13
HYPER 63				
MISSION SD6	HSH6335044	HSH6337044	HSH6103044	BR63H02
MACH 60	HSH6335034	HSH6337034	HSH6303034	BR63H03
HYPER 81				
MISSION SD8	HSH8135045	HSH8137045	HSH8103045	BR81H03
QL80	HSH8135108	HSH8137108	HSH8103108	BR81H05

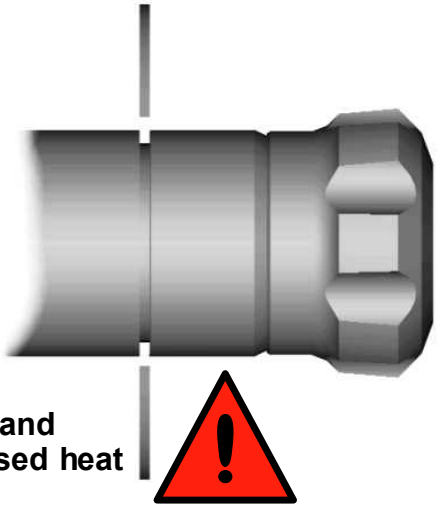
5. AIR CONSUMPTION



6. STRIPPING HYPER HAMMER



After extensive drilling the chuck might become to tight to loosen on a Bulroc Bench Splitter or the drill rig.
If this problem occurs the breakout washer can be ground or drilled out, which will relieve the pressure and enable the chuck to be removed.



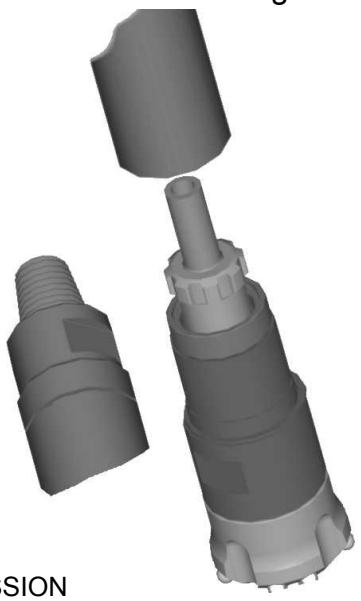
(NB On no account should the wearsleeve be impacted by a hand hammer. Splitting should not be assisted by the use of localised heat i.e. Blow torch.)

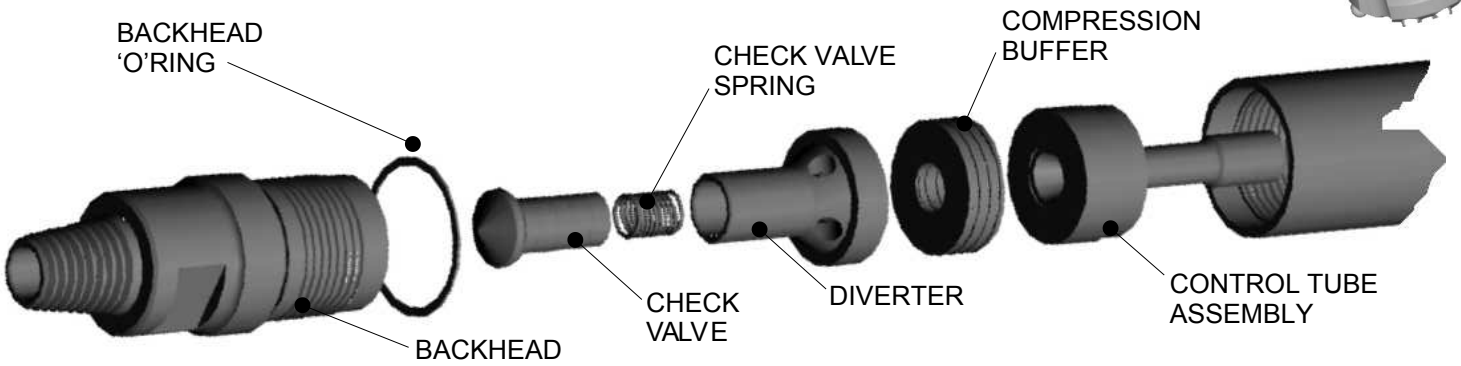
Assuming now both the Chuck and Backhead threads have been loosened either on the drilling rig, or a hammer splitter. The stripping procedure is as follows.

1. First remove the Chuck assembly. This comprises the Button Bit, Chuck, Chuck Release Washer and the Bit Retainers.

2. With the hammer laid horizontal, unscrew the Backhead and remove it from the Wearsleeve. The Diverter along with the Check Valve arrangement can now be pulled from the Backhead end.

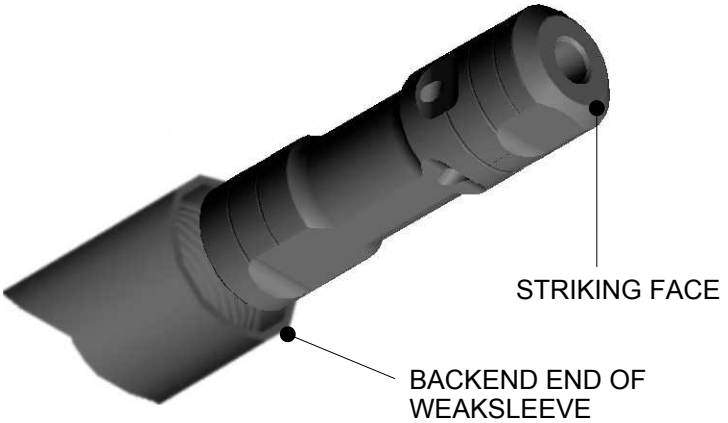
3. The remaining Compression Buffer and Control Tube assembly can best be removed by lifting the Chuck end of the Wearsleeve which will allow the Piston to push the parts up to the end face, from where they can be removed by hand.





4. Lifting the Chuck end of the Wearsleeve again will allow the Piston to slide to the end face from where it can be removed by hand.

5. Unless there is damage to the Piston Retaining Ring it should not be necessary to remove it from the Wearsleeve. However if the Retainer is damaged it can be removed by dropping the inverted Piston onto the ring from the Backhead end of the Wearsleeve.



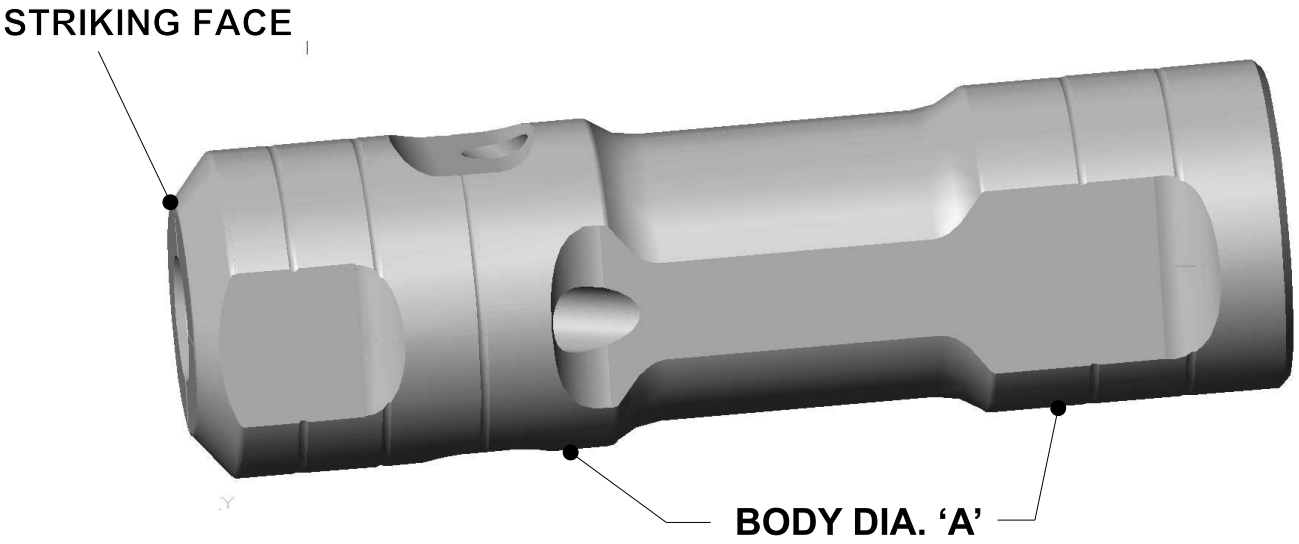
7. CHECKING FOR WEAR & DAMAGE

PISTON

Premature wear to internal parts is a result of either:

1. Incorrect or insufficient lubrication.
2. The ingress of debris into the hammer.
3. Incorrect service and storage.

The maximum wear allowances shown in this section are a guide as to when to replace parts. In certain conditions parts may need to be replaced before they reach the sizes shown.



1. There are two main areas to examine on a used Piston. Check the Body diameter 'A' for signs of 'Pick-up' and burning (both are signs of poor lubrication.) Using a micrometer, measure the diameter and refer to the table below for the minimum size.

Any light 'Pick-up' marks can be removed by using emery cloth, however if there are signs of overheating and cracking, the Piston should be replaced and the lubrication system examined.

2. Secondly, using a micrometer, measure the diameter of the bore at both ends of the piston and refer to the maximum quoted sizes.

3. Examine the striking face. Distortion is acceptable proving there are no signs of cracking. Burrs and dents can be removed with an emery stone.

Hammer	Minimum Ø (A)
Hyper 31	2.443 (62.05mm)
Hyper 41	2.993" (76.02mm)
Hyper 51	3.618" (91.90mm)
Hyper 63	4.575" (116.21mm)
Hyper 81	5.870" (149.109mm)

7. CHECKING FOR WEAR & DAMAGE

MAINTAINING THE PISTON

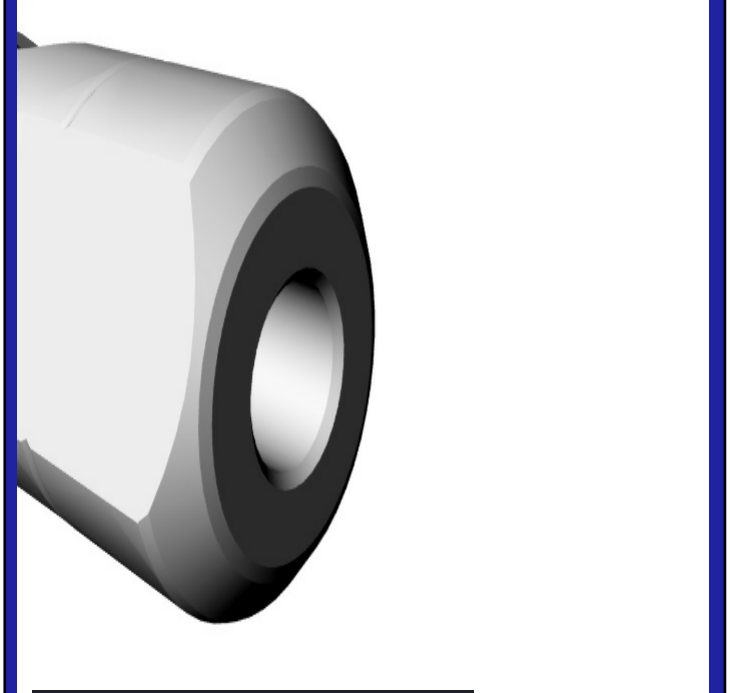


Fig.1 New Piston Face

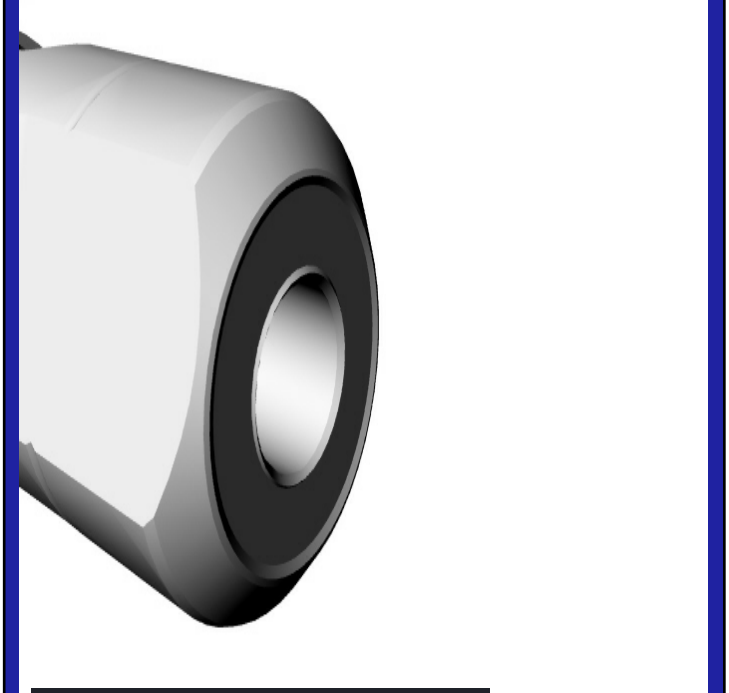


Fig. 2 Worn Piston Face

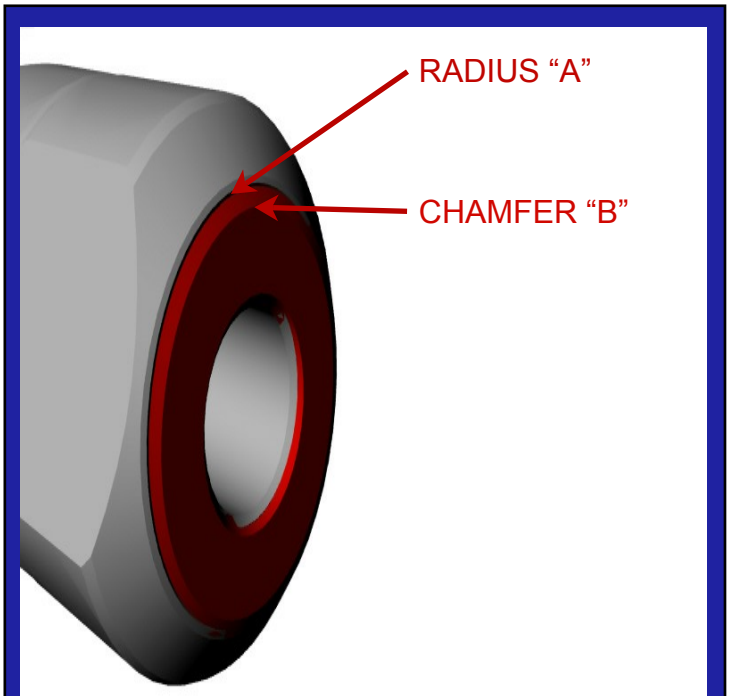


Fig. 3 Area to be machined

During the working life of the hammer the Striking Face on the Piston may become dented or deformed *(see fig.2)*. To prevent this face from cracking, or chipping, the Piston should be returned to a lathe where the strking face can be re-machined flat and then have the outer radius and inner chamfer reformed *(see fig.3)*..

Care should be taken to remove the minimum amout of material during this re-machining process and at no point should more than 2mm be removed from the face. **Pistons with wear patterns, or indentations deeper than 2mm should be replaced.**

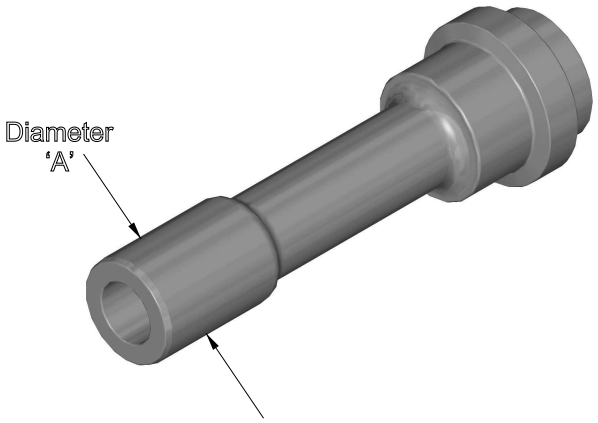
The table below contains useful machine information for reforming the piston face.

MACHINE DETAIL		
HAMMER	**RADIUS “A”**	**CHAMFER “B”**
HYPER 31	0.125”	0.060” @45
HYPER 41	0.187”	0.125” @45
HYPER 51	0.125	0.060” @45
HYPER 63	0.125”	0.060” @45
HYPER 81	0.125”	0.150” @45

8. CHECKING FOR WEAR & DAMAGE

CONTROL TUBE

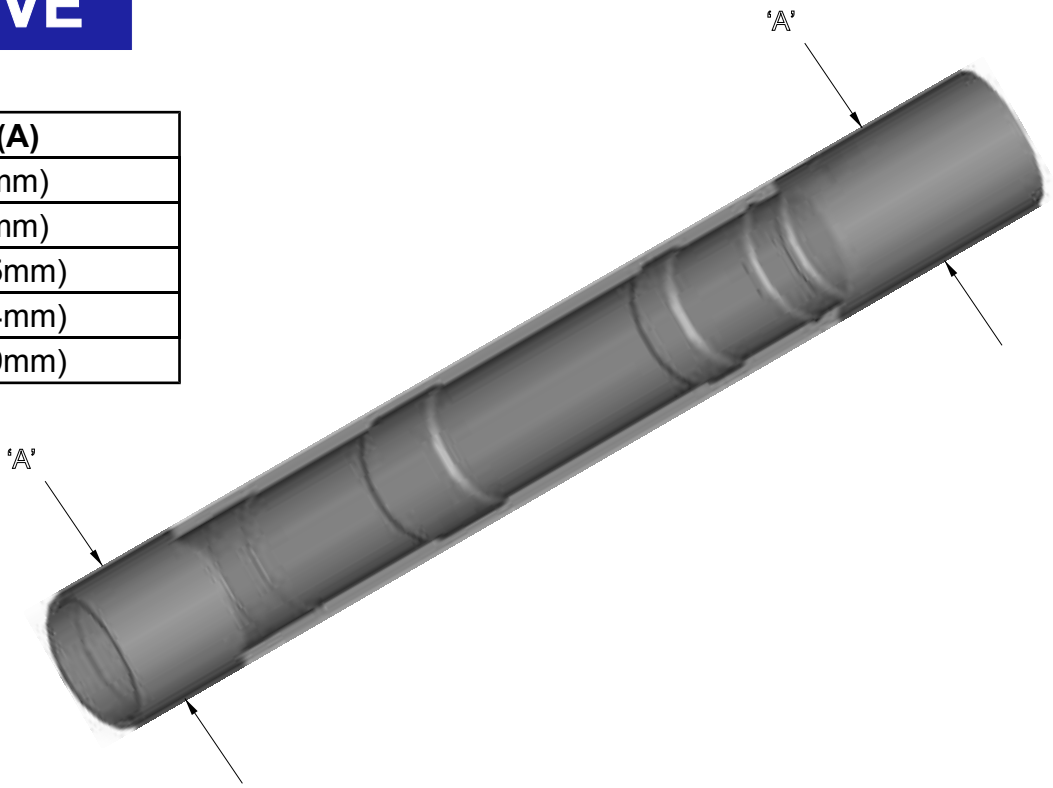
Hammer	Minimum Ø (A)
Hyper 31	1.120” (28.45mm)
Hyper 41	1.244” (31.60mm)
Hyper 51	1.544” (39.22mm)
Hyper 63	1.875” (47.62mm)
Hyper 81	2.368” (60.15mm)



Examine the Control Tube Dia.‘A’, using a micrometer, check the diameter has not worn under the specified minimum. If there are signs of ‘Pick-up’ they should be removed by using emery cloth.

WEARSLEEVE

Hammer	Minimum Ø (A)
Hyper 31	2.94” (74.61mm)
Hyper 41	3.49” (88.70mm)
Hyper 51	4.22” (107.25mm)
Hyper 63	5.25” (133.54mm)
Hyper 81	6.76” (171.89mm)

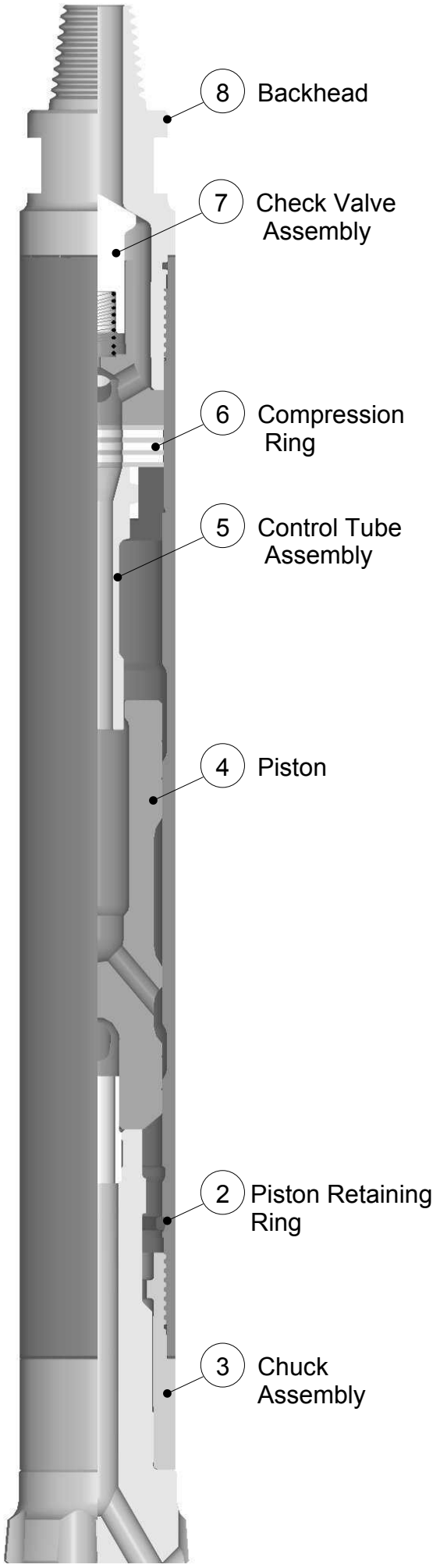


Using either a micrometer or a vernier, measure the outer diameter ‘A’ of the Wearsleeve. If it is below the minimum it must be replaced. The wear rate of the Wearsleeve can be slowed by replacing the Chuck before the wear area reaches the Wearsleeve.

The bore of the Wearsleeve should be periodically checked for any signs of ‘Pick-up’.

If a Piston has broken within the Wearsleeve it is imperative that the bore is honed to remove any Burrs or ‘Pick-up’. Failure to do so will result in ‘Pick-up’ on the replaced Piston and will lead to early failure of this component.

9. REBUILDING HYPER HAMMERS



1. Ensure all the maintenance work outlined in the previous section has been completed.

2. Stand the Wearsleeve on the floor, Chuck end upwards. Insert the Piston Retaining Ring into the bore, hammer the ring down until it springs into the groove in the Wearsleeve bore. It is important to make sure that the Piston Retaining Ring is positioned in the groove correctly. Failure to do so will seriously effect hammer performance.

NOTE: The Hyper 51 Wearsleeve has two piston retaining ring grooves and requires the ring to be fitted into the correct groove for the chuck/bit configuration used.

350R Bit : 1st groove from end face at chuck end
QL50/MACH 50 Bit 2nd groove from end face at chuck end

3. Clamp the Wearsleeve horizontally in a vice taking care not to overtighten the jaws. Assemble the Chuck, Chuck Release Washer and Bit Retainers around the Bit ensuring the Retainers are fitted with a new 'O'Ring. Cover the threads with a copper based grease. Then lift the whole assembly into the Wearsleeve. Screw the Chuck fully in until there is no gap between the Wearsleeve and the Chuck Release Washer.

4. Coat the Piston with rock drill oil and slide it into the Backhead end of the Wearsleeve. (ensure the Piston striking face enters first.)

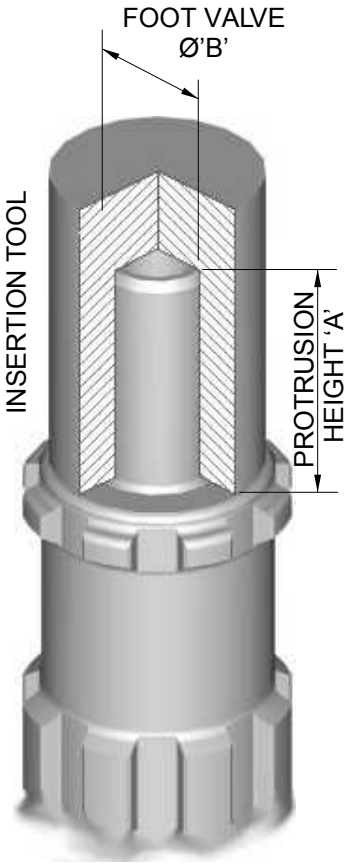
5. Assemble the two Control Tube Buffers around the Control Tube and then push the assembly into the Tube Holder. Coat the outside of the assembly with rock drill oil and insert it into the Backhead end of the Wearsleeve.

6. Slide the Compression Ring on to the Control Tube Assembly

7. Insert the Spring into the Check Valve, and then slide the assembly into the Valve Chest. Push the whole assembly down onto the Compression Ring.

8. Fit a new 'O'Ring to the Backhead and coat the threads with a copper based thread grease. Screw the Backhead into the Wearsleeve until it is hand tight, then measure the gap between the Wearsleeve face and the lock-up face on the Backhead. This gap should be a minimum of 1 mm, if the gap is smaller, the ring should be removed and replaced with a new Compression Ring. When the gap exceeds 1mm the Backhead should be fully tightened using the appropriate Backhead spanner.

10. BUTTON BIT FOOTVALVES



Bulroc Hyper hammers are designed to be used with Foot Valves that are to the following specifications:

	INSERTION TOOL No.	PROTRUSION HEIGHT 'A'	FOOT VALVE DIAMETER 'B'	SHANK TYPE
HYPER 31	FVIT038	1.916" 48.7mm	0.880" 22.35mm	MACH 33
HYPER 41	FVIT091	2.235" 56.8mm	1.055" 26.79mm	DHD 340A
HYPER 51	FVIT092	2.630" 66.8mm	1.370" 34.80mm	DHD 350R
HYPER 63	FVIT093	1.940" 49.3mm	1.500" 38.10mm	DHD 360
HYPER 81	FVIT098	1.890" 48.0mm	2.000" 50.80mm	DHD 380

To guarantee the diameter and protrusion height are correct it is recommended the correct insertion tool is used.

Using Foot Valves which are larger in diameter than the sizes shown, will result in premature failure of the Foot Valve.

Foot Valves which are much smaller in diameter than the sizes shown will reduce the performance of the hammer.

11. LUBRICATION

The Hyper piston's oscillate at around 1000 bpm at 150 psi (10bar). It is therefore extremely important that an adequate supply of the correct type of rock drill oil is constantly fed to the hammer's whilst they are operating.
Failure to do so will quickly lead to excessive component wear and if the oil supply is cut of for any reason, the pistons will quickly seize inside the wearsleeve, resulting in irreparable damage to both components.
An air line lubrication system should be installed, preferably on the drill rig. The lubricator reservoir should be of sufficient capacity to supply the required volume of rock drill oil for a full shift. With larger hammers, this may be impractical but the capacity should be sufficient for at least half a shift.
This is equally important that the lubricator system must be adjustable and have a visual check to ensure the lubricator does not run out of oil.
As a good general guide, all Bulroc Hyper hammers require a third of a pint of oil per hour, per 100cfm of air through the hammer (0.07 litre per metre cubed)

Eg Hyper 41 operating at 300psi = 427cfm = 1.42 pints per hour
21bar = 12.1cmm = 0.8 litre per hour

The amount of lubricating oil should be increased by 50% when drilling with water or foam.
When new drill pipes are added to the drill string, it is recommended that a half pint (a quarter of a litre) of rock drill oil is poured into the pipe to provide a good internal coating and helps prevent the hammer from running dry at any time. The grade of rock drill oil will be determined by the ambient temperature at the drilling site. If the ambient temperature is between 0 and 25 degree centigrade, then a 30 grade oil should be used. If the ambient temperature is greater than 25 degree centigrade, use a 50 grade oil.
Bulroc supply their own recommended rock drill oil and this is detailed below, together with other brands of suitable oils.

MAKE	TYPE 30 GRADE	TYPE 50 GRADE
BULROC	T220	T320
BP	ENERGOL RD-E 100	ENERGOL RD-E 300
CHEVRON	ARIES 100	ARIES 320
SHELL	TORCULA 100	TORCULA 320
ESSO/EXXON	AROX EP100	AROX EP320

12. HYPER HAMMER STORAGE

We recommend following the points listed below when removing a 'Down hole hammer' from service. This will ensure trouble free operation once the hammer starts work again.

The hammer should be stripped and cleaned and free of all water/moisture as possible.
Bulroc 320 or similar rock drill oil should be poured into backhead (see chart below for quantity) allowing all parts to be coated throughout the hammer.
Both ends of the hammer should be then covered to prevent the ingress of dirt, etc.
It should be then laid horizontally in a dry environment ready for use next time.

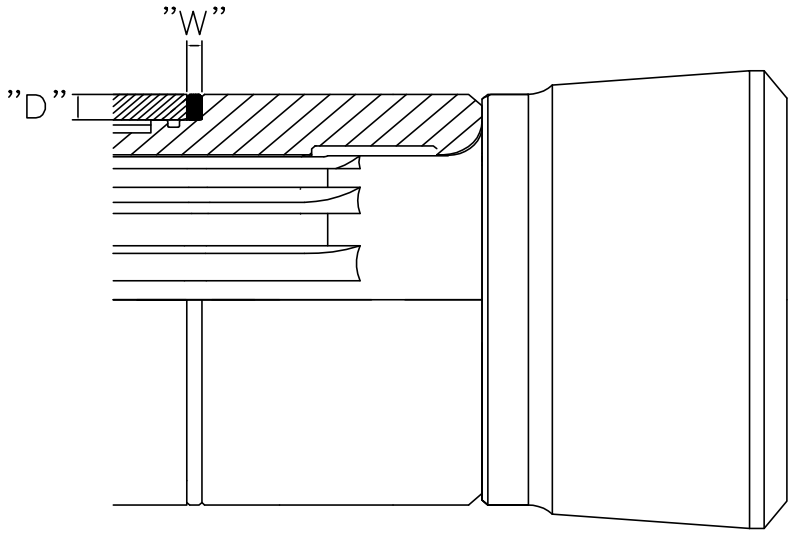
Model	Qty in UK Pints	Qty in liter's
Hyper 31	¼	0.14
Hyper 41 & 51	½	0.28
Hyper 63 & 81	¾	0.43

If this procedure is followed then apart from protecting the hammer from corrosion it will protect the parts from premature wear and of course reduce 'down time' and eventual repair costs.
However we strongly recommend that the hammer, especially if stored for any long periods of time should be stripped, cleaned, inspected and re-oiled prior use to be sure of smooth drilling.

13 .TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
INOPERATIVE DRILL	Drill bit blowholes blocked	Unblock holes
	Dirt inside drill	Strip and clean drill
	Worn or damaged parts	Replace damaged parts
	Insufficient lubrication	Check oil level, adjust lube needle value
	Excessive lubrication	Adjust lube needle value
	Hanging Piston	Pistion stuck. Polish out the score marks
	Insufficient air pressure	Check compressor discharge and increase to operational value
SLOW PENETRATION	Insufficient air pressure	Increase discharge pressure
	Dull drill bit	Re-grind or change bit
	Worn drill parts	Replace worn parts
	Too much or too little lubrication	Check oil level and if necessary adjust lube needle value
	Dirt in drill	Strip and clean
LOW RETURN AIR VELOCITY	Insufficient hole flushing air passing through hammer	Drill or increase hole size through the piston
	Drill bit exhaust holes blocked	Clean out blockage
SPASMODIC OPERATION	Failed or damaged parts	Overhaul drill
	Lack of oil	Check lubrication
	Drill bit broken	Replace bit
	Dirt in drill	Strip and clean

A. CHUCK RELEASE WASHERS



CHUCK RELEASE WASHERS		
HAMMER MODEL	"W"	"D"
HYPER 31	0.160" - 400mm	0.187" - 4.76mm
HYPER 41	0.130" - 3.30mm	0.250" - 6.35mm
HYPER 51	0.160" - 400mm	0.280" - 7.11mm
HYPER 63	0.310" - 7.87mm	0.295" - 7.49mm
HYPER 81	0.150" - 3.81mm	0.485" - 12.32mm

Chuck Release Washers are fitted to the Bulroc Range of Hyper Hammers to assist the removal of the Chuck from the Wearsleeve after drilling.

The Chuck Release Washer is manufactured from a composite material that reduces the friction between the lock up faces on the Chuck and Wearsleeve making it easier to overcome the tensional loading applied to these parts during the drilling process.

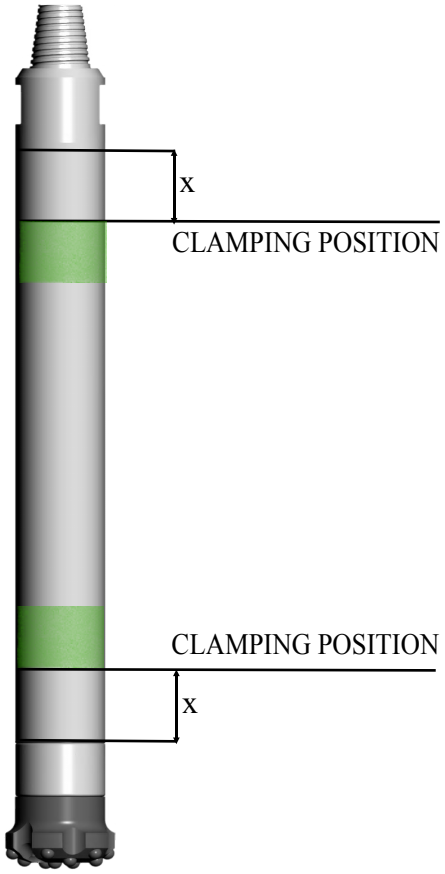
Due to the forces applied to the Chuck Release Washer you may find that its thickness ("W") is reduced during the drilling cycle and it is therefore recommended that a new Washer be fitted each time the Chuck is removed.

It is possible that on some of the larger Hammers in the Bulroc range, when drilling with large diameter Button Bits or Overburden Systems, certain conditions can generate higher torques than normally expected, resulting in difficulties when trying to remove the Chuck from the Wearsleeve. Should this occur then the removal of the Chuck can be achieved by cutting away the Chuck Release Washer. We do however stress at this point that cutting away the Chuck Release Washer is a final option and should not be done until all other options have proved unsuccessful.

If the cutting away of the Chuck Release Washer is necessary for the removal of the Chuck then it must be done with extreme care to avoid damage to either the Chuck or the Wearsleeve. The composition of the Chuck Release Washer allows for it to be cut with either a hacksaw or a small hand grinder equipped with a slitting wheel. The hacksaw method is much safer and less likely to damage the Chuck or Wearsleeve, but obviously much slower than the hand grinder with a slitting wheel. To remove the Chuck Release Washer a cut must be made in the centre of the washer all the way around it's circumference, and completely through the Washer, thus transforming the single washer into two thinner washers that will then spin freely. Great care must be taken, especially if the Washer is cut with a slitting wheel, to ensure that the cut only penetrates the Washer and does not pass through into the body of the Chuck.

The size shown as 'D" in the above table should be your MAXIMUM depth of cut, and it is recommended that either the saw blade or the slitting wheel are marked in some way so as to indicate when they have achieved this depth.

B. CLAMP POSITIONS



CLAMP POSITIONS	
HAMMER MODEL	"X" DISTANCE FROM WEARSLEEVE END FACE
Hyper 31	4.000" / 102mm
Hyper 41	4.750" / 121mm
Hyper 51	5.375" / 137mm
Hyper 63	7.750" / 197mm
Hyper 81	7.000" / 178mm

There are many different "Splitting" Machines available for unscrewing the threaded connections on a Bulroc Hyper Hammer, some are attachments to the Drill Rig, others are independent hydraulic units, or purpose made Bench arrangements. Regardless of which machine is chosen they all require some method of securing the Wearsleeve whilst applying a torque to either the Chuck or Backhead.

The most common machines use either Clamps or Chains around the O/D of the Wearsleeve and the positioning of these is very important, if they are placed too close to the joint being "Split" they will in effect increase the frictional forces on the threaded connection making it impossible to unscrew the component from the Wearsleeve.

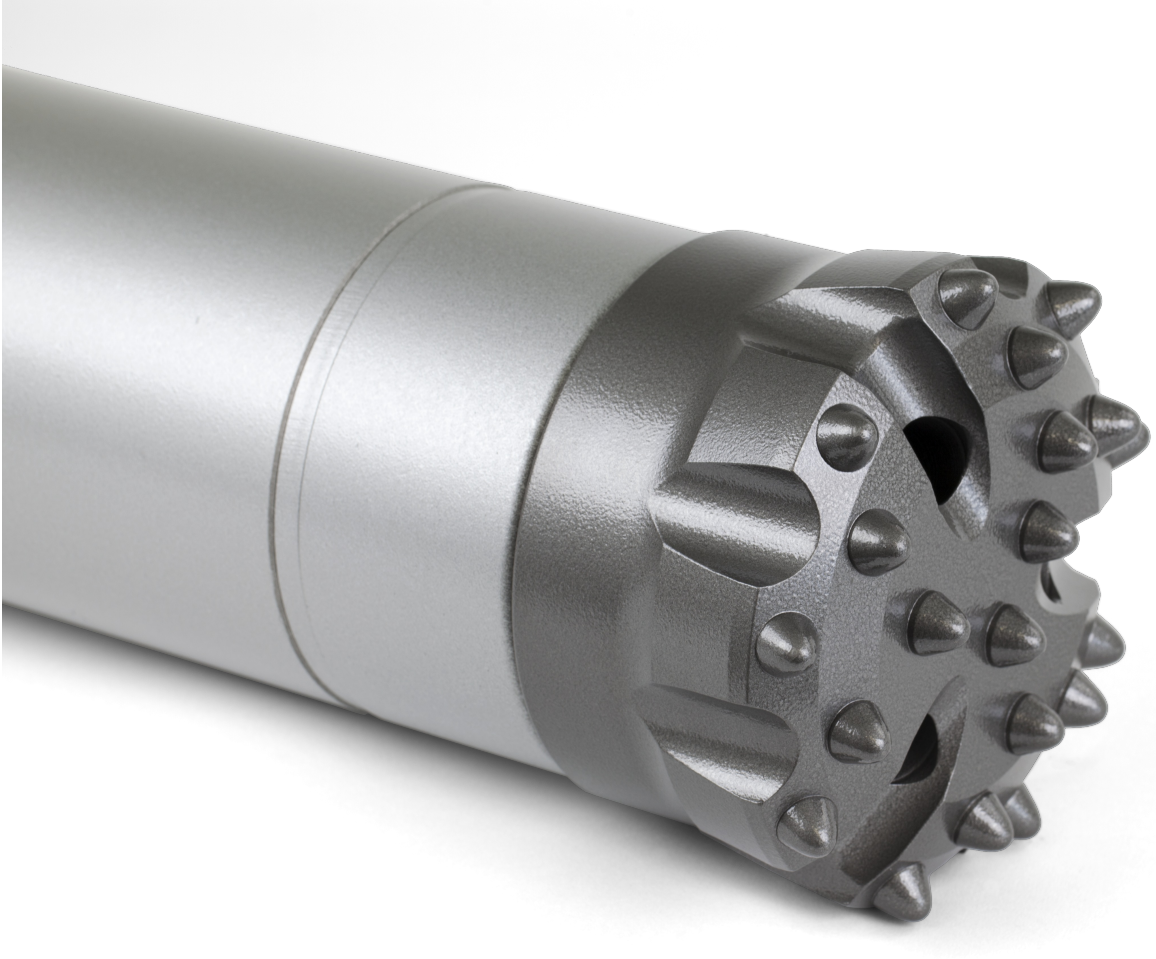
The above table shows the correct position for the clamping mechanism to ensure no additional load will be applied to the threaded connection, thus making the joint easier to split.

Due to the high torque loads applied to a Hammer during its drilling cycle, equally high loads are required to "Split" the Chuck and Backhead away from the Wearsleeve and because of this the clamping arrangement around the Wearsleeve must generate enough friction to prevent it from spinning during the process. However, great care must be taken to make sure the clamps or chains are not over-tightened as this can cause deformation to the Wearsleeve that can result in both Wearsleeve failure and Piston seizure once the Hammer is returned to service.

To help increase the Wearsleeve's resistance to deformation it is recommended that the Hammer Piston is first slid to the end of the Hammer being "split", before clamps of chains are attached. By doing this the Piston O/D will limit the amount of deformation in the Wearsleeve bore if too much clamping pressure is applied.

NOTE:

The use of Chain type Hydraulic Breakers can leave deep intrusions in the O/D of the Wearsleeve which may result in stress concentrations that could lead to premature failure of the Wearsleeve.



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